


### Quiz 1

1. How many total **processes** are running (i.e., including all in different states like waiting) shortly after the Ubuntu VM boots up?

1. `ps -e | wc -l`

2. 

```
noza@noza-VirtualBox:~/Desktop$ ps -e | wc -l
197
```

3. Process Status - `ps` command - is used to list running processes in Linux. It displays the currently running processes in real-time. Total processes running on my VM is **197**.

2. How many total **threads** are running (i.e., including all in different states like waiting) shortly after the Ubuntu VM boots up?

1. `echo $(( `ps axms | wc -l` - 1 ))`

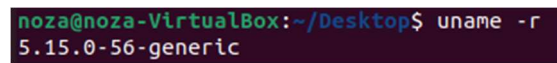
2. 

```
noza@noza-VirtualBox:~/Desktop$ echo $(( `ps axms | wc -l` - 1 ))
635
```

3. The command above shows the total number of threads running, which is **635**.

3. What is the **version number of the Linux kernel** installed on your Ubuntu VM?

1. `uname -r`

2. 

```
noza@noza-VirtualBox:~/Desktop$ uname -r
5.15.0-56-generic
```

3. `uname` command is used to print out certain system information, which includes kernel name. From the above screenshot, my Linux kernel version is **5.12.9-56**, where:

5 – Kernel version

12 – Major revision

9 – Minor revision

56 – Patch level/number

`generic` – Linux kernel/distro specific additional information

4. What is the model name of the CPU(s) of the VM? According to wikipedia or Intel/AMD specification pages, how many CPU cores does this CPU have? If the information is available, what was the release date of the CPU, and the original retail price?

1. `cat /proc/cpuinfo`

2.

```
noza@noza-VirtualBox: ~/Desktop
noza@noza-VirtualBox:~/Desktop$ cat /proc/cpuinfo
processor       : 0
vendor_id      : GenuineIntel
cpu family     : 6
model          : 142
model name     : Intel(R) Core(TM) i7-10510U CPU @ 1.80GHz
stepping       : 12
microcode      : 0xffffffff
cpu MHz        : 2304.004
cache size     : 8192 KB
physical id    : 0
siblings       : 2
core id        : 0
cpu cores      : 2
apicid         : 0
initial apicid : 0
fpu            : yes
fpu_exception  : yes
cpuid level    : 22
wp             : yes
flags          : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
                pat pse36 clflush mmx fxsr sse sse2 ht syscall nx rdtscp lm constant_tsc rep_g
                ood nopl xtopology nonstop_tsc cpuid tsc_known_freq pni pclmulqdq ssse3 cx16 pc
                id sse4_1 sse4_2 movbe popcnt aes rdrand hypervisor lahf_lm abm 3dnowprefetch i
                nvpcid_single ibrs_enhanced fsgsbase bti1 bti2 invpcid rdseed clflushopt md_cle
                ar flush_lid arch_capabilities
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs srbds mmio_sta
                le_data retbleed eibrs_pbrsb
bogomips       : 4608.00
```

```
noza@noza-VirtualBox: ~/Desktop
le_data retbleed eibrs_pbrsb
bogomips       : 4608.00
clflush size    : 64
cache_alignment : 64
address sizes    : 39 bits physical, 48 bits virtual
power management:

processor       : 1
vendor_id      : GenuineIntel
cpu family     : 6
model          : 142
model name     : Intel(R) Core(TM) i7-10510U CPU @ 1.80GHz
stepping       : 12
microcode      : 0xffffffff
cpu MHz        : 2304.004
cache size     : 8192 KB
physical id    : 0
siblings       : 2
core id        : 1
cpu cores      : 2
apicid         : 1
initial apicid : 1
fpu            : yes
fpu_exception  : yes
cpuid level    : 22
wp             : yes
flags          : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
                pat pse36 clflush mmx fxsr sse sse2 ht syscall nx rdtscp lm constant_tsc rep_g
                ood nopl xtopology nonstop_tsc cpuid tsc_known_freq pni pclmulqdq ssse3 cx16 pc
```

```
noza@noza-VirtualBox: ~/Desktop
stepping       : 12
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                pat pse36 clflush mmx fxsr sse sse2 ht syscall nx rdtscp lm constant_tsc rep_g
                ood nopl xtopology nonstop_tsc cpuid tsc_known_freq pni pclmulqdq ssse3 cx16 pc
                id sse4_1 sse4_2 movbe popcnt aes rdrand hypervisor lahf_lm abm 3dnowprefetch i
                nvpcid_single ibrs_enhanced fsgsbase bti1 bti2 invpcid rdseed clflushopt md_cle
                ar flush_lid arch_capabilities
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs srbds mmio_sta
                le_data retbleed eibrs_pbrsb
bogomips       : 4608.00
clflush size    : 64
cache_alignment : 64
address sizes    : 39 bits physical, 48 bits virtual
power management:
```

3. `/proc/cpuinfo` display what type of processor the system is running, which includes the number of CPUs present. The output would show the details of the processor, CPU family, model name, CPU MHz, cache size, flags, etc. On my VM, the model names of the CPU 0 and CPU 1 are the same: **Intel(R) Core(TM) i7-10510U CPU @ 1.80GHz**. According to Intel specifications pages, these processors have **2** CPU cores and their recommended retail price is **450.00** USD.
5. What is the total size of the memory **swap space** (virtual memory) in **MB** on the VM?

1. `free -g -ht --si`

```
noza@noza-VirtualBox: ~/Desktop$ free -g -ht --si
```

	total	used	free	shared	buff/cache	availabl
Mem:	4.5G	712M	2.9G	34M	866M	3.5
Swap:	2.7G	0B	2.7G			
Total:	7.2G	712M	5.6G			

- 2.
3. `free` command gives information about the memory usage and memory swap of the system. On my VM, the total swapped is **2700** MB.
6. What is the free disk space of the root disk partition in MB? In Linux, the root partition is always mounted at `/`. A mount point is the directory or location in the file system where an I/O device has been mounted. The mount point is used to access the device through a file system.

1. `df -h`

```
noza@noza-VirtualBox: ~/Desktop$ df -h
```

Filesystem	Size	Used	Avail	Use%	Mounted on
tmpfs	449M	1.5M	447M	1%	/run
/dev/sda3	24G	13G	11G	55%	/
tmpfs	2.2G	0	2.2G	0%	/dev/shm
tmpfs	5.0M	4.0K	5.0M	1%	/run/lock
/dev/sda2	512M	5.3M	507M	2%	/boot/efi
tmpfs	449M	2.4M	447M	1%	/run/user/1000

- 2.
3. `df` command (Disk Filesystem) is used to check disk space, it displays the available and used storage of the files on the machine. `-h` flag is used to display the result in a human readable format. Hence, the free disk space of the root disk partition is **11000** MB.
7. What is the total number of inodes on the root filesystem? If unfamiliar with what an inode is, look up the definition and how to display the number of free/used inodes on Linux/Ubuntu.

1. `ls -lai /`

```

noza@noza-VirtualBox:~/Desktop$ ls -lai /
total 2744408
  2 drwxr-xr-x 20 root root      4096 Jan  5 16:47 .
  2 drwxr-xr-x 20 root root      4096 Jan  5 16:47 ..
 13 lrwxrwxrwx  1 root root         7 Jan  5 16:39 bin -> usr/bin
262145 drwxr-xr-x  4 root root      4096 Jan  9 19:11 boot
659678 drwxrwxr-x  2 root root      4096 Jan  5 16:47 cdrom
   1 drwxr-xr-x 20 root root      4240 Jan 10 13:18 dev
393217 drwxr-xr-x 131 root root    12288 Jan  9 19:10 etc
655361 drwxr-xr-x  3 root root      4096 Jan  5 16:48 home
 14 lrwxrwxrwx  1 root root         7 Jan  5 16:39 lib -> usr/lib
 15 lrwxrwxrwx  1 root root         9 Jan  5 16:39 lib32 -> usr/lib32
 16 lrwxrwxrwx  1 root root         9 Jan  5 16:39 lib64 -> usr/lib64
 17 lrwxrwxrwx  1 root root        10 Jan  5 16:39 libx32 -> usr/libx32
 11 drwx-----  2 root root    16384 Jan  5 16:38 lost+found
524289 drwxr-xr-x  2 root root      4096 Aug  9 04:48 media
917505 drwxr-xr-x  2 root root      4096 Aug  9 04:48 mnt
1048577 drwxr-xr-x  2 root root      4096 Aug  9 04:48 opt
   1 dr-xr-xr-x 254 root root         0 Jan 10 13:18 proc
1179649 drwx-----  4 root root      4096 Jan  5 17:03 root
   1 drwxr-xr-x 33 root root       860 Jan 10 13:18 run
 18 lrwxrwxrwx  1 root root         8 Jan  5 16:39 sbin -> usr/sbin
393219 drwxr-xr-x 11 root root      4096 Aug  9 04:55 snap
1048578 drwxr-xr-x  2 root root      4096 Aug  9 04:48 srv
 12 -rw-----  1 root root 2810183680 Jan  5 16:39 swapfile
   1 dr-xr-xr-x 13 root root         0 Jan 10 13:18 sys
917506 drwxrwxrwt 20 root root      4096 Jan 10 15:32 tmp
1179650 drwxr-xr-x 14 root root      4096 Aug  9 04:48 usr
786433 drwxr-xr-x 14 root root      4096 Aug  9 04:54 var

```

2.

3. I ran `ls` command, where the `-l` option stands for long listing format, `-a` stands for all files, and `-i` stands for print the index number of each file. Hence, the total number of inodes on the root filesystem is **2744408**.

8. What is the average round trip time (RTT) of 10 ICMP ping packets from your Ubuntu VM to [www.google.com](http://www.google.com) [Links to an external site.](#)?

1. `ping -c 10 www.google.com`

```

noza@noza-VirtualBox: ~/Desktop
1179650 drwxr-xr-x 14 root root      4096 Aug  9 04:48 usr
786433 drwxr-xr-x 14 root root      4096 Aug  9 04:54 var
noza@noza-VirtualBox:~/Desktop$ ping -c 10 www.google.com
PING www.google.com (142.251.215.228) 56(84) bytes of data.
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=1 ttl=116 ti
me=8.20 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=2 ttl=116 ti
me=8.04 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=3 ttl=116 ti
me=8.99 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=4 ttl=116 ti
me=9.47 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=5 ttl=116 ti
me=7.22 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=6 ttl=116 ti
me=9.12 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=7 ttl=116 ti
me=10.4 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=8 ttl=116 ti
me=9.24 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=9 ttl=116 ti
me=9.40 ms
64 bytes from sea09s35-in-f4.1e100.net (142.251.215.228): icmp_seq=10 ttl=116 t
ime=9.18 ms

--- www.google.com ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9201ms
rtt min/avg/max/mdev = 7.223/8.922/10.360/0.836 ms
noza@noza-VirtualBox:~/Desktop$

```

- 2.
3. -c flag is used to specify the number of ECHO\_REQUEST's to be sent following each ping, in this question it's 10. As the last line of output shows, the average RTT of 10 ICMP ping packets is **8.922**.

9. What is the interface name of the network interface device used to route the ICMP ping packets to [www.google.com](http://www.google.com) [Links to an external site.](#)?

1. route
- 2.

```

noza@noza-VirtualBox:~/Desktop$ route
Kernel IP routing table
Destination    Gateway         Genmask         Flags Metric Ref    Use Iface
default        _gateway       0.0.0.0         UG    100    0      0 enp0s3
10.0.2.0       0.0.0.0        255.255.255.0   U     100    0      0 enp0s3
link-local     0.0.0.0        255.255.0.0     U     1000   0      0 enp0s3

```

3. route interface is used to access the kernel's routing tables, which shows how the system is currently configured. Hence, the interface name of the network interface device used to route is **enp0s3**.

10. Identify the file system type of the "/" root partition? Briefly describe this file system type (1-2 sentences).

1. df -Th

```
noza@noza-VirtualBox:~/Desktop$ df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs           tmpfs     449M   1.5M  447M   1% /run
/dev/sda3       ext4      24G    13G   11G  55% /
tmpfs           tmpfs     2.2G     0   2.2G   0% /dev/shm
tmpfs           tmpfs     5.0M   4.0K   5.0M   1% /run/lock
/dev/sda2       vfat      512M   5.3M   507M   2% /boot/efi
tmpfs           tmpfs     449M   2.4M   447M   1% /run/user/1000
```

- 2.
3. /dev/sda3 file system type is **ext4** and /dev/sda2 file system type is **vfat**. ext4 file system type is a journaling file system, which means there are no fragmentation issues and the read/write are significantly faster with Ext. vfat file system type has maximum of 4 GB file-size.